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Is alcopop consumption in Switzerland associated with riskier drinking patterns and more alcohol-related problems?

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ABSTRACT

Objectives To examine (a) whether consumers of alcopops compared to consumers of other alcoholic beverages but not alcopops have riskier drinking patterns and more alcohol-related consequences (e.g. truancy, scuffles, problems with parents) and (b) whether the amount of alcopops consumed is associated independently with risky drinking patterns and alcohol-related consequences over and above those associated with the amount of other alcoholic beverages consumed. **Sample** As part of the ESPAD international study, a cross-sectional national representative sample of 5444 drinkers aged 13–16 years was interviewed by means of an anonymous, self-report questionnaire administered in a classroom setting. **Results** Earlier initiation of consumption, more frequent risky single occasion drinking (RSOD), and a higher likelihood of negative consequences for consumers than for non-consumers of alcopops were due mainly to higher overall consumption. Other alcoholic beverages had similar effects, and whether the same amount of alcohol was consumed as alcopops or as any conventional alcoholic beverage made no difference. **Conclusions** Alcopops in Switzerland do not seem to be linked to specific riskier drinking patterns or consequences *per se*. Like all alcoholic beverages, they add to the problems caused by drinking and seem to be consumed in addition to conventional alcoholic beverages without replacing them. As the alcohol industry will continue to launch new beverages, prevention targeting alcohol consumption in general might be more effective than focusing on new beverages only.

Keywords Adolescents, alcohol consumption, alcopops, consequences, risky single occasion drinking (RSOD), school class, Switzerland.

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INTRODUCTION

The New Oxford Dictionary of English [1] defines 'alcopops' as 'ready mixed soft drinks containing alcohol'. Alcopops are also known as RTDs (ready to drink) or FABs (flavoured alcoholic beverages) and tend to be sweet, served in small bottles (typically 200–275 ml), and to contain between 5 and 7% alcohol by volume [2].

In the late 1990s, alcopops were introduced and promoted as a new variety of alcoholic beverage. With its sweet taste, colourful look and trendy advertisements, these products are apparently designed to appeal to young people, especially girls (e.g. [3–5]). The concerns expressed towards alcopops were (a) that they aim to seduce minors, who commonly do not like the taste of alcohol, to initiate alcohol consumption (e.g. [5–8]) and (b) that they lead to increased volume of drinking and to more frequent intoxication in adolescents, because the taste of alcohol is masked by the means of sweeteners [3,6,8,9]. Both dimensions of alcohol consumption, volume and intoxication, have been linked with numerous consequences among adolescents [10–14]. Similarly, earlier onset of alcohol consumption has been found to be associated with more frequent drinking and drinking larger amounts, as well as with earlier onset of episodes of drunkenness [15–20] and more alcohol problems in the

life course [21–26]. Thus, whether alcopops contribute to the earlier onset of drinking and drunkenness, more consumption and more harm is of major research interest.

However, despite many concerns about alcopops in the media and among politicians and public health advocates [27], stringent research studies on the effects of alcopop consumption are sparse. Research indicates mainly that alcopops have a positive and attractive image among adolescents [7,28,29] and have become one of the most popular alcoholic beverages among adolescents, particularly girls, in established market economies in Europe [e.g. 12,30–35]. The preference for alcopops seems to be a transient behavior that decreases with age [28] and alcopops rarely remain the most preferred alcoholic beverage at older ages [36,37]. A preference for alcopops at younger ages, however, cannot be equated with earlier onset of drinking or drunkenness; we failed to find studies on earlier onset in our literature search.

The research available is mixed on alcopop consumption and increased volume of drinking. In Wales, all the increase in prevalence of at least weekly alcohol consumption in 11–12-year-olds and half the increase for 13–14-year-olds has been attributed to the increased prevalence of weekly consumption of alcopops [30,31]. According to surveys in Sweden, the introduction of alcopops and sweet ciders accounted for approximately half the increase in volume of alcohol consumed on the last drinking occasion by 15–16-year-old boys between 1996 and 1999, and two-thirds of the increase among girls [7]. These studies indicate that alcopops did not replace other traditional alcoholic beverages but were consumed additionally, confirming the common finding that the introduction of 'new beverages' to the market results in additional consumption and not a replacement of 'old beverages' [38,39]. These studies, however, used repeated cross-sectional surveys, where earlier surveys without questions on alcopops were compared with later surveys including questions on alcopops, and therefore a general increase in drinking was confounded with more questions on alcohol consumption asked. It has been shown consistently that the more questions are asked with alcohol measurement instruments the higher is the yielded consumption [40], and therefore part of the attribution of alcopops to an increased consumption may be artificial.

Findings on intoxication are also not unanimous. Hughes *et al.* [28] reported that designer drinks are associated more strongly with drunkenness than conventional drinks, but they focused on fortified wines and strong ciders with alcohol content between 13% and 21%: thus, alcohol contents that were much higher than those of alcopops, which commonly have an alcohol content of about 5–6% [41]. In contrast, Brain & Parker [42] indicated that 'first choice alcopop drinkers' are less likely to drink heavily on the last occasion; and a British study among 13–15-year-olds hospitalized for acute alcohol intoxication could not identify one case where alcopops were responsible [43]. In Germany [12] and Britain [44] the risk for drunkenness of adolescent alcopop consumers was higher than that of wine consumers but lower than that of spirits consumers. Forsyth [27] found no significant relation of alcopop consumption to more episodes of drunkenness compared to the consumption of other alcoholic beverages, as well as a potential influence of media on level of alcopop consumption.

The few studies examining possible associations between consumption of alcopops and alcohol-related consequences are discordant. It appears that studies that actually did find an association between alcopop consumption and consequences also found a overall higher quantity of alcohol consumed by alcopop consumers. Thus, effects of alcopops on consequences may be mediated through a higher overall intake of ethanol. Brain & Parker [42] concluded that alcopop drinkers are the least likely to have engaged in such possibly harmful situations as being arrested, being stopped by the police, being convicted or having unprotected sex, or sex that was later regretted. MacCall [45] could not find any additional association between consuming alcopops and alcohol-related problems among adults compared to findings on other alcoholic beverages.

In view of the lacking or inconclusive research evidence on alcopop consumption, the present study seeks to shed further light by testing the following hypotheses:

1 Being an alcopop consumer is associated with an earlier onset of alcohol consumption and drunkenness compared to consumers of other alcoholic beverages. Also, the amount of alcopops consumed is associated negatively with the age of initiating alcohol consumption and the age of being drunk for the first time.

2 Alcopop consumers drink more alcohol than non-alcopop consumers, and the amount of alcopops consumed is associated positively with increased frequency and amount of drinking.

3 Alcopop consumers are more often drunk than non-alcopop consumers, and the amount of alcopops consumed increases the likelihood of higher frequencies of drunkenness.

4 Increased alcopop consumption is associated positively with alcohol-related negative health and social consequences.

5 All associations are markedly reduced when adjusted for volume of drinking, indicating a mediation of associations through volume.

METHODS

Study design and sample

In 2003 Switzerland participated for the first time in the 'European School Survey Project on Alcohol and Drugs' (ESPAD 46). The ESPAD core questionnaire was administered in classes between the end of April and the end of June and took about 45 minutes to be completed. The students could choose freely to participate and confidentiality was ensured at all stages of the study. Questionnaires were returned in a sealed and anonymous envelope.

As primary sampling units, 473 classes of 8th to 10th grades were chosen randomly from a list provided by the Swiss Federal Statistical Office. An overall response rate of 83.1% was achieved. Non-response was due primarily to non-participating classes; 95.9% of all students belonging to participating classes responded. Non-response at the individual level was to more than 90% due to students not attending school the day of interview. The exact percentage could not be determined, because some teachers did not provide the classroom report in which absenteeism of students should be mentioned. As students were not informed in advance about the day of interview, non-response at the individual level was thus probably due mainly to other factors such as illness, and not active refusal by students. The sample consists of 6993 students, born between 1986 and 1989. For data analysis related to alcohol consumption, students who did not report drinking alcohol during the past 12 months ($n = 1158$; 16.6%) were coded as abstainers. Students with no information on alcohol consumption during the past 12 months ($n = 19$; $< 0.1\%$) or no information on beverage-specific questions for the last drinking occasion ($n = 372$; 5.3%) were excluded, resulting in a sample size of $n = 6602$ students. All inferential analyses were restricted to past-year drinkers only ($n = 5444$). The sample can be considered as representative for 8th, 9th and 10th graders in public schools in Switzerland. According to information of the Swiss Federal Statistical Office students in secondary private schools account for less than 5% of all secondary school students, and concern predominantly special schools, e.g. for mentally disabled students, which should not be included in the ESPAD sampling frame or schools teaching in other languages than the offical national languages (e.g. English).

Measures

An interdisciplinary research group from the participating countries developed the questionnaire [46]. The high reliability and validity of the questionnaire has been shown by several methodological studies (see [46] for an overview). The ESPAD questionnaire was translated under the supervision of Swiss Institute for the Prevention of Alcohol and other Drug Problems (SIPA) into the three languages spoken most frequently in Switzerland: German, French and Italian.

Alcohol consumption measurements

Alcopop consumers and amount of alcopops consumed last time. The adolescents were asked, 'The last time you had an alcoholic drink, did you drink any alcopop? If so, how much?'. The possible answers were 'I never drink alcopops', 'I did not drink alcopops on my last drinking occasion', 'less than two regular bottles or cans (< 55 cl)', 'two to four regular bottles or cans (55–110 cl)', 'five to eight regular bottles or cans (137.5–220 cl)' and 'nine or more regular bottles or cans (> 247.5 cl)'. Those indicating 'I never drink alcopops' were coded as 'alcopop non-consumer' (0) all others as 'alcopop consumer' (1). 'Amount of alcopops' consumed on last occasion was converted into grams of pure ethanol (with an alcohol volume percentage of 5.8 according to information from the Swiss Federal Alcohol Board [47].

Amount of alcohol consumed last time. Similarly structured questions and answers as for alcopops were used to assess the quantity of 'beer', 'cider', 'wine' and 'spirits' drunk last time. For further analyses the following variables were used: 'total amount' (sum of alcopops, beer, cider, wine and spirits) and 'amount of other beverages' (excluding alcopops, i.e. the sum of beer, cider, wine and spirits). All amounts were converted into drinks of 15 g reflecting the average drink size of ESPAD measures.

Age of onset of drinking and first drunkenness. Students had to indicate the age when they first drank a full glass of either wine, beer or spirits (including alcopops). Age was coded continuously, with a code of 10.5 for the lowest category (11 years or younger). The same categories were used for the age where students 'got drunk on alcohol' for the first time.

Drinking frequency, usual amount and volume. Volume was obtained for the consumption in the past months by means of a generic quantity–frequency measure (QF). For frequencies, the questions ask for occasions with answer categories '0', '1–2', '3–5', '6–3', '10–19', '20–39' and '40 or more'. Mid-points of categories were used and 45 occasions for the upper category (40 times plus half range to mid-point of adjacent category). Usual amount when drinking was asked in standard drinks of beer, wine, spirits and alcopops, approximating about 15 g of ethanol per drink. Volume of alcohol consumption (in drinks per day) in the past 30 days was obtained by multiplying frequencies with the usual amount.

Intoxication

Risky single occasion drinking (RSOD). The question 'Think back once more over the last 30 days. How many

times (if any) have you had five or more drinks in a row?', with possible answers 'none', 'one', 'two', 'three to five', 'six to nine' and '10 or more times'.

Perceived drunkenness. The question was 'On how many occasions (if any) have you been drunk from drinking alcoholic beverages? (during the last 30 days)'. The answer categories were 'none', 'one to two', 'three to five', 'six to nine', '10–19', '20–39' and '40 or more'. Frequencies of RSOD and 'being drunk' used mid-points of categories and 11.25 times for the upper category of RSOD and 45 occasions for the upper category for the frequency of drunkenness.

Alcohol-related consequences

Truancy. The adolescents were asked 'during the last 30 days how many entire days of school have you missed (because you skipped or "cut")?'. The answers were dichotomized into 'never' (0) and 'once or more' (1).

Scuffle, accident, parents, performance and sexual intercourse. The question was 'have you ever had any of the following problems?'. The list of consequences included 'scuffle or fight' (scuffle), 'accident or injury' (accident), 'problems in your relationship with your parents' (parents), 'performed poorly at school or work' (performance), 'engaged in sexual intercourse you regretted the next day' and 'engaged in sexual intercourse without a condom' (the variable sexual intercourse combines the two, so that 'yes' indicates that one or the other have occurred).

Statistical analysis

Overall, we followed the methodological strategy laid out in the concept on theory-based data analysis by Aneshensel [48]. We first defined a focal relationship, i.e. the relation between alcopop consumption and the dependent variable of importance based on the hypotheses specified above. For continuous dependent variables (hypotheses 1–3) multiple linear regressions were estimated and for dichotomous dependent variables (hypothesis 4) logistic regressions were used. Each hypothesis was tested for two indicators of alcopop consumption. First (model 1), alcopop consumers were compared to non-consumers of alcopops (but alcohol consumers in general), and secondly (model 2), the amount of alcopops consumed on the last occasion was considered.

After establishing the focal relationship in base models where the main independent variable (i.e. alcopop consumer or amount of alcopops) were adjusted only for gender and age (models 1a, 2a), the exclusionary strategy of control was used (see [48]). Exclusionary variables are defined by being associated with both the dependent and the focal independent variable. Thus, in a second set of models (models 1b, 2b), the strength of the focal relationship between alcopop indicators and dependent variables was tested while including overall consumption variables in addition to age and sex. The impact of alcopop consumption status and amount of alcopops consumed on the dependent variables was adjusted for volume of usual intake, either overall volume in the case of status, or volume of other beverages excluding amount of alcopops consumed. Thus, comparing model 1a with model 1b would indicate whether the status of being an alcopop consumer or not is associated independently with onset, consumption patterns and consequences by statistically removing the effects of volume of drinking. Similarly, comparing models 2a and 2b would help to clarify the independence of the effect of quantity of alcopop consumption. Because the participant students have been selected by a cluster sampling method, the multiple regressions were adjusted for design effects of clusters (classes) and strata (cantons) by using survey estimations with STATA [49].

To clarify further the role of alcopops in comparison with other alcoholic beverages, path analytical models were calculated separately for all beverages. This corresponds to the recommended strategy of Aneshensel [48] to rule out alternative explanations: for instance, spuriousness. The statistical models tested direct paths, whereby a direct path links the independent variable with the dependent variable, whereas the indirect path links the independent and the dependent variables through the mediating variable. Usual volume was used as the mediating variable for models testing the effects of being a consumer of a particular beverage (beer, wine, spirits, alcopops), and total amount drunk on last occasion was used as the mediating variable for models testing the effects of beverage-specific amounts.

An overview of significant direct and indirect paths, at a level of $P < 0.05$, was made by beverage: (a) across the six dependent consumption variables (onset of drinking, onset of drunkenness, frequency of usual consumption, usual amount, RSOD and perceived drunkenness) and (b) the six consequence items. One-sided tests were performed, with associations going in the hypothesized direction, i.e. younger ages of onset, more consumption, more frequent drunkenness or higher odds ratios for consequences. This analysis provides an additional summary on whether alcopops are related more strongly with consumption patterns and consumption consequences than other alcoholic beverages. Direct and indirect paths and corresponding confidence intervals can be estimated with Mplus [50]. However, Mplus does not allow accounting for cluster sampling, and thus standard errors may be underestimated and confidence intervals too narrow. As the main aim of this analysis, however, was comparison of the relative importance of different

beverages, the underestimation of standard errors should not matter, as it applied equally to all beverages.

RESULTS

Table 1 provides an overview of variables used in the present study. Alcohol consumption is common among adolescents in Switzerland. Almost 90% of 15–16-year-old boys and girls consumed alcohol at least once a year.

The following analyses concerning alcopop consumption were based on drinkers only ($n = 5444$). Among boys, beer and alcopops were the most preferred alcoholic beverages, and the proportion of alcopops to overall consumption decreased from 33% to 28% (calculated on amounts on the last occasion) between ages 13–14 and 15–16 years. Alcopops was clearly the most preferred alcoholic beverage for girls, making up about 45% of overall alcohol consumption.

Alcopop consumers initiated alcohol consumption earlier (model 1a; crude $b = -0.391$; $P < 0.001$) than non-consumers of alcopops. These associations remained significant (model 1b; $b = -0.312$; $P < 0.001$) after adjusting for volume of drinking. The negative associations were found similarly in stratified (by age and sex) analyses (results not presented). Being an alcopop consumer was not associated with age of first drunkenness in either of the models on consumption status (models 1a and 1b). We repeated the analysis on age of initiation for other beverages as well, e.g. being a beer drinker versus not being a beer drinker (results not shown). For all five beverages (beer, wine, cider, spirits and alcopops) the same significant ($P < 0.001$) relationship with age of onset was found. Hence, this association was not specific to being an alcopop consumer.

Amount of alcopops drunk at the last occasion was associated strongly and negatively with age of onset (model 2a; $b = -0.135$; $P < 0.001$) and, in addition but to a lesser extent, with age of first drunkenness (model 2; $b = -0.061$; $P < 0.001$). The associations were stable in stratified analyses across age groups and gender (results

Table 1 Sample characteristics.

	Boys (age, years)		*Girls (age, years)*	
	13–14	*15–16*	*13–14*	*15–16*
Complete sample ($n = 6993$)	1653	1800	1691	1849
Alcohol consumers (12 months), %	77.5	88.9	78.7	87.6
Alcohol consumers ($n = 5444$)	1190	1524	1212	1518
Alcopops consumer, %	84.2	88.7	89.7	93.9
Amount of alcohol consumed last time[1]				
Amount alcopops	1.27	1.39	1.20	1.26
Amount beer	1.31	2.06	0.57	0.65
Amount cider	0.32	0.42	0.22	0.27
Amount wine	0.88	1.03	0.55	0.60
Amount spirits	0.12	0.14	0.05	0.05
Age				
Of initiation	11.8	12.6	12.1	12.9
Of first drunkenness	13.3	14.3	13.5	14.4
Volume (30 days)				
Number of drinking occasions (past 30 days)	4.97	7.09	3.41	4.53
Usual amount (in drinks[1])	2.11	2.81	1.91	2.22
Volume (in drinks[1] per day)	0.53	0.90	0.33	0.47
Problem drinking				
Being drunk (freqency past 30 days)	1.01	1.69	0.56	0.85
RSOD (frequency past 30 days)	1.32	1.89	0.91	1.08
Consequences, %				
Truancy[2]	7.5	13.7	9.5	17.2
Scuffle[3]	61.4	60.8	39.9	35.5
Accident[3]	62.8	65.7	61.6	62.2
Parents[3]	43.5	46.1	63.4	66.6
Performance[3]	44.7	48.9	50.9	56.2
Sexual intercourse[3]	11.8	17.8	10.3	16.8

[1]No. of standard drinks (containing approx. 15.0 g of pure alcohol); [2]at least once past 30 days; [3]at least once in life-time.

not presented). The associations were reduced remarkably when the volume of other beverages were included in the models (model 2b); the associations of other beverages were even stronger (e.g. model 2b, age first drunkenness; alcopops: b = –0.034, $P < 0.01$; other alcoholic beverages: b = –0.050, $P < 0.000$). The coefficients can be compared directly, as both amount of alcopops and amount of other beverages had the same scale of standard drinks (Table 2).

Adolescents who drank alcopops reported a higher frequency of drinking and higher usual amount (see Table 3, $P < 0.001$ for both models 1a and 1b) in unadjusted models (model 1a; please note that all models were adjusted for age and sex; unadjusted means that the model has only one additional independent variable in addition to age and sex). Similar associations were found in all age groups (results not presented). Adjusted for volume (model 1b), the strength of the association dropped more considerably for frequency of drinking than for usual amount, but both remained significant ($P < 0.01$ for number of occasions and $P < 0.001$ for usual amount).

A similar pattern could be observed with respect to the associations with amount of alcopops consumed last time (model 2b). Again, for both dependent variables (drinking frequency and usual amount), the amount of alcopops consumed on the last occasion significantly ($P < 0.001$) contributed in approximately the same way as other alcoholic beverages (e.g. $b_{alcopops} = 0.943$ versus $b_{other} = 0.978$ for model 2b on drinking frequency).

Alcopop consumers had a higher frequency of RSOD and perceived drunkenness than those who do not drink alcopops in unadjusted models ($P < 0.001$ for both models 1a (see Table 4). Being an alcopop consumer remained significantly positively associated with RSOD ($P < 0.001$) when adjusting for volume (model 1b), but the association was non-significant (and negative) for perceived drunkenness.

With regard to models about amount (model 2) the association between the amount of alcopops last time and RSOD and perceived drunkenness dropped remarkably but remained significant ($P < 0.001$) when adjusting for amount consumed in the form of other beverages last time. Each standard drink (on the last occasion) consumed in the form of alcopops increased the frequency of RSOD and perceived drunkenness to about the same or an even lesser extent than each standard drink consumed in the form of other beverages (e.g. $b_{alcopops} = 0.325$ versus

Table 2 Multiple linear regression models of alcopops consumption (consumption status and amount last time) on age of onset of drinking and the age of being drunk first time.

	Age of onset				*Age first drunkenness*			
Regression models[1]	*b*	*95% CI (b)*		*t*	*b*	95% CI *(b)*		*t*
1a Alcopops consumer	–0.391	–0.251	–0.531	–5.357***	0.050	–0.129	0.237	0.524 NS
1b Alcopops consumer	–0.312	–0.161	–0.446	–4.207***	0.086	–0.083	0.281	0.928 NS
Volume	–0.234	–0.201	–0.263	–14.712***	–0.159	–0.189	–0.127	–10.023***
2a Amount alcopops last time	–0.135	–0.113	–0.157	–11.898***	–0.061	–0.083	–0.041	–5.641***
2b Amount alcopops last time	–0.079	–0.055	–0.102	–6.595***	–0.034	–0.056	–0.014	–3.098**
Amount other beverages last time	–0.089	–0.076	–0.102	–13.772***	–0.050	–0.062	–0.039	–8.575***

NS: non-significant ($P > 0.05$), **$P < 0.01$, ***$P < 0.001$. [1]All models were adjusted for gender and age.

Table 3 Multiple linear regression models of alcopops consumption (consumption status and amount last time) on frequency of drinking and usual amount.

	Frequency of drinking				*Usual amount*			
Regression models[1]	*b*	*95% CI (b)*		*t*	*b*	*95% CI (b)*		*t*
1a Alcopops consumer	2.323	1.703	2.881	7.945***	1.143	1.025	1.245	20.088***
1b Alcopops consumer	0.378	0.109	0.616	2.911**	0.892	0.791	0.973	19.258***
Volume	5.754	5.649	5.883	100.072***	0.744	0.698	0.793	31.000***
2a Amount alcopops last time	1.549	1.346	1.743	15.506***	0.399	0.376	0.424	32.103***
2b Amount alcopops last time	0.943	0.741	1.124	9.757***	0.258	0.233	0.285	19.539***
Amount other beverages last time	0.978	0.880	1.079	19.086***	0.228	0.212	0.243	29.155***

**$P < 0.01$, ***$P < 0.001$. [1]All models are adjusted for gender and age.

Table 4 Multiple linear regression models of alcopops consumption (consumption status and amount last time) on frequency of risky single occasion drinking (RSOD) and of perceived drunkenness.

	RSOD				*Perceived drunkenness*			
Regression models[1]	*b*	*95% CI (b)*		*t*	*b*	*95% CI (b)*		*t*
1a Alcopops consumer	0.821	0.645	0.969	10.297***	0.571	0.205	0.803	4.067***
1b Alcopops consumer	0.428	0.292	0.547	6.737***	–0.033	–0.294	0.165	–0.284 NS
Volume	1.144	1.071	1.222	28.955***	1.806	1.488	2.095	11.401***
2a Amount alcopops last time	0.550	0.491	0.604	19.399***	0.609	0.472	0.761	8.191***
2b Amount alcopops last time	0.325	0.273	0.372	12.893***	0.323	0.218	0.448	5.302***
Amount other beverages last time	0.360	0.333	0.383	27.546***	0.463	0.392	0.537	11.997***

NS: non-significant ($P > 0.05$), ***$P < 0.001$; *b* = raw coefficient, [1]All models are adjusted for gender and age.

Table 5 Multiple logistic regression models of alcopops consumption (consumption status and amount last time) on consequences.

	Truancy				*Scuffle*			
Regression models[1]	*OR*	*95% CI (OR)*		*t*	*OR*	*95% CI (OR)*		*t*
1a Alcopops consumer	1.395	1.022	1.903	2.099*	1.329	1.108	1.593	3.072**
1b Alcopops consumer	1.290	0.943	1.764	1.593 NS	1.258	1.047	1.512	2.446*
Volume	1.316	1.246	1.390	9.856***	1.184	1.114	1.258	5.458***
2a Amount alcopops last time	1.186	1.138	1.235	8.155***	1.078	1.042	1.115	4.357***
2b Amount alcopops last time	1.082	1.032	1.135	3.239**	1.039	1.002	1.077	2.051*
Amount other beverages last time	1.140	1.111	1.169	10.15***	1.067	1.045	1.088	6.233***
	Accident				*Parents*			
1a Alcopops consumer	1.20	1.020	1.458	2.177*	1.424	1.189	1.705	3.845***
1b Alcopops consumer	1.212	1.013	1.452	2.096*	1.383	1.153	1.659	3.493***
Volume	1.031	0.981	1.084	1.205 NS	1.132	1.075	1.193	4.645***
2a Amount alcopops last time	0.980	0.949	1.012	–1.229 NS	1.068	1.033	1.103	3.896***
2b Amount alcopops last time	0.976	0.943	1.011	–1.370 NS	1.022	0.986	1.059	1.177 NS
Amount other beverages last time	1.006	0.987	1.026	0.648 NS	1.078	1.056	1.100	7.176***
	Performance				*Sexual intercourse*			
1a Alcopops consumer	1.365	1.143	1.630	3.438***	2.425	1.733	3.395	5.166***
1b Alcopops consumer	1.331	1.113	1.592	3.131**	2.261	1.594	3.207	4.577***
Volume	1.084	1.033	1.138	3.281**	1.38	1.304	1.459	11.23***
2a Amount alcopops last time	1.074	1.040	1.110	4.298***	1.299	1.252	1.348	13.980***
2b Amount alcopops last time	1.058	1.022	1.095	3.185**	1.206	1.157	1.256	8.975***
Adj. amount other beverages last time	1.026	1.006	1.045	2.612**	1.126	1.099	1.153	9.623***

NS: non-significant ($P > 0.05$), *$P < 0.05$, ** $P < 0.01$, ***$P < 0.001$; *OR* = odds ratio. [1]All models are adjusted for gender and age.

$b_{other} = 0.360$ for models on RSOD). These associations can be observed consistently in all age groups and both genders in stratified analysis (results not presented).

The odds ratios for scuffles, accidents, problems with parents, poor performance at school or work and engaging in risky or regretted sexual intercourse were significantly higher (at least $P < 0.05$) for adolescents who drink alcopops compared to those who drink alcohol, but not alcopops. Only for truancy did the association become insignificant after adjusting for volume.

The amount of alcopops drunk on the last occasion was associated positively and significantly with experiencing alcohol-related consequences (with the exception of accidents, model 2a). The association beween amount of alcopops last time was no longer significant in the adjusted model (2b) for problems with parents. Compared to the associations of other beverages, the amount of alcopops had lower odds ratios for truancy, scuffle and problems with parents and higher odds ratios on poor performance and sexual intercourse (Table 5).

Finally, for the direct comparison of the relationships of different beverages, path models were analysed. Table 6 summarizes these associations for the consumption status mediated through volume of drinking across

Table 6 Number of significant ($P < 0.05$) direct and indirect (mediated through volume of drinking) paths for models of beverage-specific consumption status on alcohol consumption measures and consequences.

		Boys (age, years)				*Girls (age, years)*			
		13–14		*15–16*		*13–14*		*15–16*	
Depending variable	*Alcoholic beverage*	*Indirect*	*Direct*	*Indirect*	*Direct*	*Indirect*	*Direct*	*Indirect*	*Direct*
Consumption measures[1]	Alcopop	5	2	5	4	5	2	5	3
	Beer	5	3	6	3	5	5	6	6
	Wine	5	1	6	3	3	3	6	5
	Spirits	6	3	6	4	5	4	6	4
	Cider	6	2	6	1	5	4	5	4
Consequences[2]	Alcopop	2	4	3	1	0	2	1	3
	Beer	2	0	1	1	4	4	5	1
	Wine	2	0	3	4	3	0	5	1
	Spirits	2	4	3	6	3	5	4	4
	Cider	3	3	4	0	5	2	5	2

[1]Maximum = six significant effects: age of onset of drinking, age of first drunkenness, frequency of drinking, usual amount, RSOD, perceived drunkenness.
[2]Maximum = six significant effects: truancy, scuffle, accident, problems with parents, performance in school and regretted sex or sex without condoms.

Table 7 Number of significant ($P < 0.05$) direct and indirect (mediated through total amount consumed on last occasion) paths for models of beverage-specific amounts consumed on last occasion on alcohol consumption measures and consequences.

		Boys (age, years)				*Girls (age, years)*			
		13–14		*15–16*		*13–14*		*15–16*	
Depending variable	*Alcoholic beverage*	*Indirect*	*Direct*	*Indirect*	*Direct*	*Indirect*	*Direct*	*Indirect*	*Direct*
Consumption measures[1]	Alcopop	6	0	6	0	6	1	6	0
	Beer	6	1	6	1	5	0	6	1
	Wine	5	2	6	1	5	1	6	0
	Spirits	5	0	6	0	5	0	6	0
	Cider	6	0	6	1	5	0	6	0
Consequences[2]	Alcopop	3	0	5	1	4	0	4	0
	Beer	4	0	3	1	4	2	5	0
	Wine	4	0	4	0	5	0	5	0
	Spirits	4	0	3	1	5	0	4	0
	Cider	4	1	4	0	5	0	5	0

[1]Maximum = six significant effects: age of onset of drinking, age of first drunkenness, frequency of drinking, usual amount, RSOD, perceived drunkenness.
[2]Maximum = six significant effects: truancy, scuffle, accident, problems with parents, performance in school and regretted sex or sex without condoms.

(a) the six consumption measures used in the present analysis, namely age of onset, age of first drunkenness, frequency of drinking, usual amount of drinking, RSOD and perceived drunkenness, and (b) across the six consequences.

Being an alcopop consumer, compared to drinkers who do not consume alcopops, did not reveal consistently either more indirect or direct associations than other beverages. In fact, it was commonly among the two beverages with the fewest significant findings.

Similar analyses were performed for beverage-specific amounts on the last occasion adjusted for the total amount on this occasion (Table 7). Again, for alcopops there were no more significant associations commonly found as for other alcoholic beverages. Moreover, the associations with consumption were clearly mediated through total intake for all beverages (few direct associations).

DISCUSSION

Although the present study indicates that alcopop consumption was associated with more problematic drinking patterns and consequences, the associations appeared

not to be specific to alcopops but were found similarly for all alcoholic beverages. Thus, alcopops appeared not to have differential effects over those of ethanol intake in general.

Before further discussing the findings, some caveats of the study must be mentioned. As the study is cross-sectional, it cannot usually be inferred whether alcopop consumption has a causal impact. A shortcoming of the study is that measures of alcopop consumption are limited in the ESPAD core questionnaire, e.g. usual volume of alcopop consumption or initiation into alcopop consumption was not assessed. Only the status of being an alcopop consumer and the amount of alcopops consumed on the last occasion could be assessed.

As in all studies, our findings may be prone to information and selection bias. As classification of exposure and outcome status were based on self-reports, information bias would occur mainly if, e.g. heavier drinkers or drinkers who experienced consequences, *ceteris paribus*, were more likely to recall having had consumed alcopops. However, it is unlikely that information bias can explain our main results, as we found similar relationships between all kinds of different beverages. Similarly, selection bias cannot be ruled out completely, but is unlikely to explain the particular associations with alcopop consumption. First, we had a very high participation rate without any substantial refusals on the individual level. Regarding schools, it may be possible that particularly schools with a more problematic background of students (e.g. higher use patterns, more deviant behaviors, less compliance of students to participate) were more reluctant to send questionnaires back, but we see no reason why, in these schools, the relative impact of alcopops (compared with other beverages) on consequences should be distributed differentially compared to other schools. In other words, there may be the possibility that prevalences were under-estimated, but we doubt that there is a strong bias in the associations reported.

Previous articles have expressed concerns that alcopops could seduce adolescents to initiate drinking at younger age (e.g. [5–8]) or to earlier episodes of drunkenness due to the ethanol-masking effects of sweeteners [3,6,8,9]. The present study could not substantiate this concern. The amount of alcopops consumed on the last occasion showed the same or even lower associations on onset of drinking as other beverages. Similarly, being a consumer of a specific beverage compared with not consuming the beverage showed earlier onset of drinking for all beverages, not alcopops alone. One potential explanation might thus be reverse causation. Earlier initiators had more time to add beverages to their drinking repertoire, and thus are more likely to be consumers of all alcoholic beverages, including alcopops. Unfortunately, the direction of effects can be tested only in longitudinal models or repeated cross-sectional models after major changes in availability of alcopops, and thus not with the present design.

Similarly, alcopops appear generally not to have specific associations on other drinking indicators such as frequency of drinking, amount of drinking or RSOD. Although there were residual associations of being an alcopop consumer even after controlling for volume of drinking, the amount of alcopops consumed on the last occasion showed the same or even lower associations than the amount consumed with other beverages. Hence, the residual associations of being an alcopop consumer after controlling for volume might be due to residual confounding. In addition, similar associations to that of being an alcopop consumer or not were also found for being a consumer of other beverages such as beer, wine or spirits. Thus, the associations of alcopops seem mainly to be mediated through generally increased consumption, a pathway true for other alcoholic beverages as well. As in other countries, alcopops in Switzerland are one of the favourite alcoholic beverages (e.g. [37,44]) and are consumed frequently (e.g. [12]). Thus, alcopops are of particular importance for the overall alcohol consumption in Swiss adolescents.

After controlling for volume, being an alcopop consumer had a residual association on RSOD but not on perceived drunkenness, i.e. of drinking five or more glasses on one occasion, but not the subjective feeling of drunkenness. This could indicate that the alcopop consumer actually drank larger amounts more often than the non-consumer of alcopops, but without the corresponding subjective feeling of being drunk, due perhaps to the masking effects of sweeteners.

The fourth goal of this study was to examine the association between the consumption of alcopops and consequences often attributed to the consumption of alcohol such as truancy, scuffles or fights, accidents or injuries, problems with their parents, poor performance at school or work and engaging in sexual intercourse regretted the next day or without using a condom (cf. [10–12,14,51]). While the odds ratios for truancy, scuffle and problems in the relationship with parents depend somewhat less on the amount of alcopops than on the amount of other alcoholic beverages, this association is reversed for performing poorly at school or work and engaging in risky or regretted sexual intercourse. Thus, there is no homogeneous pattern of associations between consumption of alcopops and consequences. Similar to Hughes *et al.* [28], but contrary to the study of Brain & Parker [42], being a consumer of alcopops showed residual associations in addition to volume for consequences, but this was also true for consumption status of other alcoholic beverages. Thus, the present study did not clarify whether alcopop consumption itself was associated with an excess of

consequences. The main path to consequences again seemed to be mediated through higher total alcohol consumption, independent of whether this is consumed with alcopops or other alcoholic beverages.

What is the public health significance of these findings? For adolescents, alcopops contributed a significant amount of total alcohol consumption, and the alcopop share was higher among younger adolescents. Alcopop consumption was associated with higher overall consumption. The present study therefore corroborates earlier studies about an additional rather than substitutive effect of new beverages entering the market. However, the limitations of the study design render this conclusion tentative.

Higher alcohol consumption was clearly associated with higher odds ratios for drunkenness (RSOD) and consequences. On the other hand, our findings did indicate few specific associations of alcopops over and above those of ethanol in general. Hence, the central question remains of whether alcopops actually increase overall consumption.

Media, politicians and public health advocates have called for legal restrictions specifically on alcopops (e.g. [27]) which have been been introduced through increased prices for alcopops, e.g. in France [52], Germany [53] and Switzerland [47]. In Switzerland, in February 2004 taxes on alcopops were increased by 300% [9] and it appears that this resulted in a strong decrease of alcopop sales (personal communication with the Swiss Alcohol Board). To date there is no indication, however, whether this also resulted in a decrease in alcohol consumption in general among adolescents or in alcohol-related consequences. The drinks industry already avoids the legal restriction on alcopops by creating new designer drinks such as beerpops or alcopops with lower sugar content that do not fall under the special tax. Similarly, there is little evidence that the reduction in availability of a specific beverage is related to a general consumption reduction if all other alcoholic beverages remained equally available [54]. Although there is evidence that no substition occurs when new beverages enter the market, evidence is lacking as to whether substitution of beverages occurs when beverages are removed from the market. Thus, instead of lagging behind the innovations of the drink industry, preventive approaches to reduce alcohol consumption in general might be more fruitful than imposing special taxes on alcopops.

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